1.3 Advantages of using DBMS Approach

VTU : July-18, 19, Jan.-20, Marks 8

Following are the advantages of DBMS :

1) DBMS **removes the data redundancy** that means there is no duplication of data in database.
2) DBMS allows to **retrieve the desired data** in required format.
3) **Data** can be **isolated** in separate tables for convenient and efficient use.
4) Data can be **accessed efficiently** using a simple query language.
5) The **data integrity** can be maintained. That means – the constraints can be applied on data and it should be in some specific range.
6) The **atomicity** of data can be maintained. That means, if some operation is performed on one particular table of the database, then the change must be reflected for the entire database.
7) The DBMS allows **concurrent access** to multiple users by using the synchronization technique.
8) The **security policies** can be applied to DBMS to allow the user to access only desired part of the database system.

Disadvantages of Database Systems

1) **Complex design :** Database design is complex, **difficult and time consuming.**
2) **Hardware and software cost : Large amount of investment** is needed to setup the required hardware or to repair software failure.
3) **Damaged part :** If one part of database is corrupted or damaged, then **entire database** may get affected.
4) **Conversion cost :** If the current system is in conventional file system and if we need to convert it to database systems then large amount of cost is incurred in purchasing different tools, and adopting different techniques as per the requirement.
5) **Training :** For designing and maintaining the database systems, the people need to be trained.

Explain the three level DBMS architecture, with a neat diagram. Why do we need mappings between schema levels? (08 marks)

This idea was first described by the ANSI/SPARC committee in late 1970's. The goal is to separate (i.e., insert layers of "insulation" between) user applications and the physical database.

- **Internal level**: has an internal/physical schema that describes the physical storage structure of the database using a low-level data model. The internal schema uses a physical data model and describes the complete details of data storage and access paths for the database.

Discuss the main characteristics of the database approach over the file processing approach. (8marks)

The main characteristics of the database approach versus the file-processing approach are as follows:

- **Self-describing nature of a database system**

A database system includes a complete definition or description of the database's structure and constraints. This description is stored in a system catalog, which contains a description of the structure of each file, the type and storage format of each field and the various constraints on the data. The information stored in catalog is called as meta-data, which describes the structure of the primary database.

In traditional file processing, data definition is part of the application programs. Hence, these programs are constrained to work with only *one specific database,* whose structure is declared in the application programs.

- **Insulation between programs and data, and data abstraction**

In traditional file processing, the structure of data files is embedded in the application programs, so any changes to the structure of a file may require *changing all programs* that access that file.

DBMS access programs do not require such changes in most cases. The structure of data files is stored in the DBMS catalog separately from the access programs. This is termed as program-data independence.

DBMS provides a conceptual or logical view of the data to application programs, so that the underlying implementation may be changed without the programs being modified.

- **Support of multiple views of the data**

Different users have different "views" or perspectives on the database. A view is a subset of the database or it contains virtual data that is derived from the database file. A good Multiuser DBMS has facilities for defining multiple views. This is not only convenient for users, but also addresses security issues of data access.

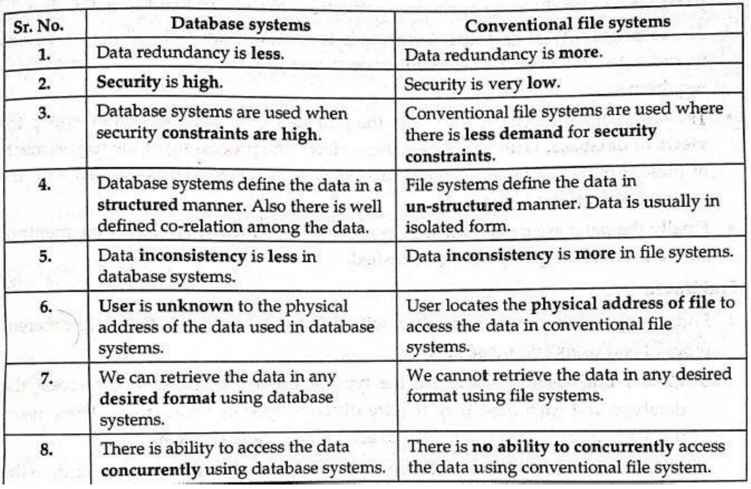
For example, one user of the database is interested only in accessing and printing the transcript of each student. A second user is interested only in checking that students have taken all the prerequisites of each course for which they register.

- **Sharing of data and multiuser transaction processing**

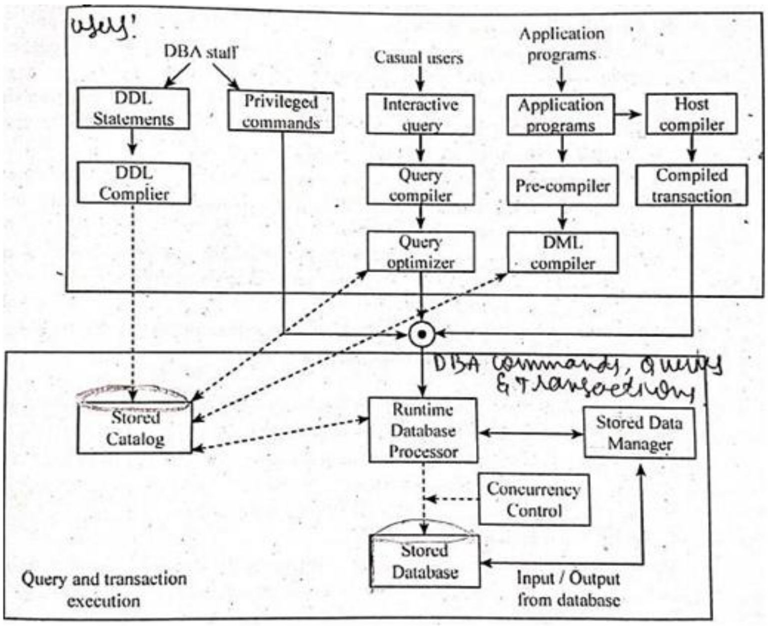
The Multiuser DBMS includes concurrency control software to ensure that several users trying to update the same data in a controlled manner in order to ensure that the result of the updates is correct.

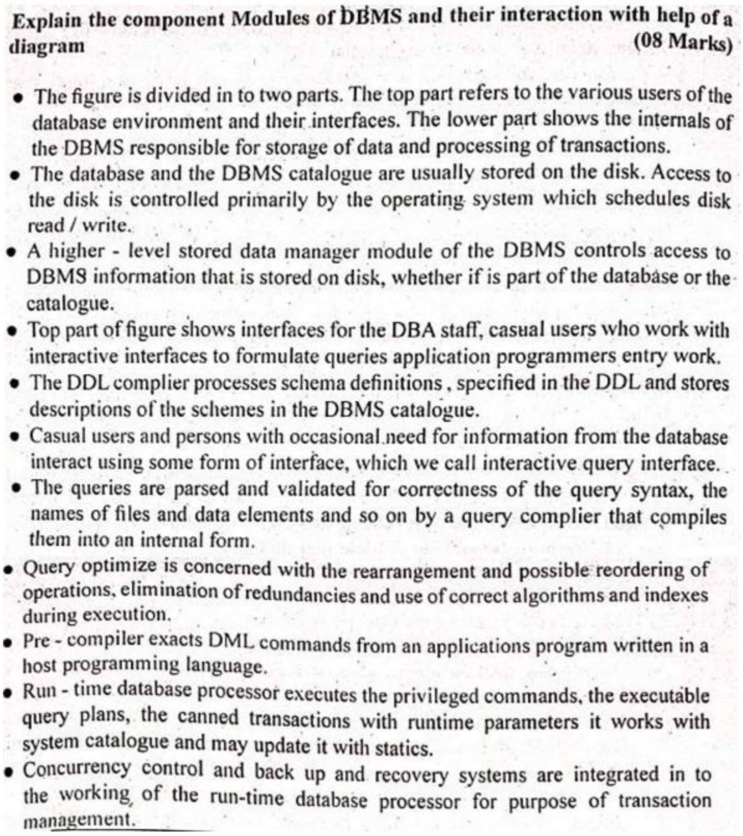
For example, when several reservation agents try to assign a seat on an airline flight, the DBMS must ensure that each seat can be accessed by only one agent at a time for assignment to a passenger. These types of applications are generally called **online transaction processing (OLTP)** applications. **Transaction** is a process that makes

Difference between Database System and Conventional File System



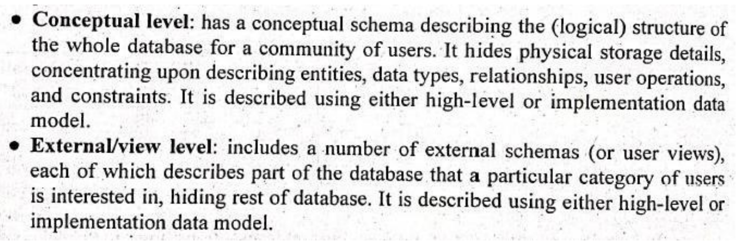
Sr. No.	Database systems	Conventional file systems
1.	Data redundancy is **less.**	Data redundancy is **more.**
2.	**Security** is **high.**	Security is very **low.**
3.	Database systems are used when security **constraints are high.**	Conventional file systems are used where there is **less demand** for **security constraints.**
4.	Database systems define the data in a **structured** manner. Also there is well defined co-relation among the data.	File systems define the data in **un-structured** manner. Data is usually in isolated form.
5.	Data **inconsistency** is **less** in database systems.	Data **inconsistency** is **more** in file systems.
6.	**User** is **unknown** to the physical address of the data used in database systems.	User locates the **physical address of file** to access the data in conventional file systems.
7.	We can retrieve the data in any **desired format** using database systems.	We can**not** retrieve the data in any desired format using file systems.
8.	There is ability to access the data **concurrently** using database systems.	There is **no ability to concurrently** access the data using conventional file system.





Explain the component Modules of DBMS and their interaction with help of a diagram **(08 Marks)**

- The figure is divided in to two parts. The top part refers to the various users of the database environment and their interfaces. The lower part shows the internals of the DBMS responsible for storage of data and processing of transactions.
- The database and the DBMS catalogue are usually stored on the disk. Access to the disk is controlled primarily by the operating system which schedules disk read / write.
- A higher - level stored data manager module of the DBMS controls access to DBMS information that is stored on disk, whether if is part of the database or the catalogue.
- Top part of figure shows interfaces for the DBA staff, casual users who work with interactive interfaces to formulate queries application programmers entry work.
- The DDL complier processes schema definitions , specified in the DDL and stores descriptions of the schemes in the DBMS catalogue.
- Casual users and persons with occasional need for information from the database interact using some form of interface, which we call interactive query interface.
- The queries are parsed and validated for correctness of the query syntax, the names of files and data elements and so on by a query complier that compiles them into an internal form.
- Query optimize is concerned with the rearrangement and possible reordering of operations, elimination of redundancies and use of correct algorithms and indexes during execution.
- Pre - compiler exacts DML commands from an applications program written in a host programming language.
- Run - time database processor executes the privileged commands, the executable query plans, the canned transactions with runtime parameters it works with system catalogue and may update it with statics.
- Concurrency control and back up and recovery systems are integrated in to the working of the run-time database processor for purpose of transaction management.



- **Conceptual level**: has a conceptual schema describing the (logical) structure of the whole database for a community of users. It hides physical storage details, concentrating upon describing entities, data types, relationships, user operations, and constraints. It is described using either high-level or implementation data model.
- **External/view level**: includes a number of external schemas (or user views), each of which describes part of the database that a particular category of users is interested in, hiding rest of database. It is described using either high-level or implementation data model.